Culturally important seabirds distribute beyond the recently established shipping avoidance area around St. Lawrence Is., northern Bering Sea

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Climate modelling predicts that the ice-free navigable portions of the Arctic Ocean will expand spatially and temporally by mid-century. In this context, Arctic vessel traffic is projected to triple by 2025. One consequence of such expanded vessel traffic in the Arctic is an increase in the threats to the marine environment and to the people who rely on the ocean as a source of food and cultural continuity. In particular, the maritime region surrounding the Bering Strait is a focal point for Arctic shipping. The convergence of expanding maritime commerce, active indigenous cultures, and biological richness in this narrow region requires robust governance to promote maritime safety, cultural protection, and environmental conservation. To this aim, shipping routes through the Bering Strait and areas to be avoided for shipping (ATBAs) have recently been adopted by the International Maritime Organization. In this study, we use GPS tracking data collected across three years on four seabird species breeding at St Lawrence Island in the northern Bering Sea (common murre *Uria aalge*, thick-billed murre *U. lomvia*, crested auklet *Aethia cristatella*, black-legged kittiwake *Rissa tridactyla*; Will et al. in revision), to examine the spatial relevance of the ATBA designated around St Lawrence Island, with respect to these species' habitat use. Among these four species, murres are currently exploited by the islanders through subsistence harvesting of the eggs and adults; the crested auklet has traditionally been exploited but its use is currently reduced; and the kittiwake has not been locally harvested. GPS data from a total of 47 at-sea foraging trips show that foraging ranges of both murres and crested auklet extended beyond the current boundaries of the St Lawrence Island ATBA. In contrast, all foraging trips sampled from one breeding kittiwake consistently remained close to the shore, within the ATBA boundaries. Using habitat modelling techniques, we show that the distribution of the long-ranging birds was significantly associated with seasonal oceanographic features, notably high surface current velocities. Applying this species-specific space-use to all seabird colonies on the island, we show that the foraging areas predicted for the locally harvested species largely extend beyond the St Lawrence Island ATBA. Our study highlights that information on habitat spatial use is fundamental to adequately define the boundaries of area-based management tools aiming to preserve marine living resources from current and/or future human activities. We show that accounting for oceanographic features that are key in structuring marine ecosystems would more likely result in designating marine protection areas that are ecologically and culturally relevant.

References

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